On the Critical Locus of Aqueous Electrolyte Solutions at High Temperatures

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A phenomenon that is of both scientific and technological interest is the effect of salt on the behavior of steam at high temperatures. Experimental data for aqueous solutions indicate that the critical temperature, critical pressure, and critical density are strongly dependent on the salt concentration, especially at low salt concentrations. For aqueous solutions of sodium chloride empirical equations have been developed that have been adopted as international standard by the International Association for the Properties of Water and Steam [1]. Incorporating the Debye-Hückel theory for the ionic interactions into the theory of critical phenomena, Kim and Fisher have subsequently shown that the critical parameters of electrolyte solutions exhibit a nonanalytic dependence on the salt concentration [2]. This development stimulated us to re-examine the available experimental data for the critical locus of aqueous salt solutions and to develop equations for the critical parameters that are consistent with the new theoretical predictions.

[1] A.A. Povodyrev, M.A. Ansimov, J.V. Sengers, W.L. Marshall, and J.M.H. Levelt Sengers, *Int. J. Thermophys.* **20**, 1529 (1999).
[2] Y.C. Kim and M.E. Fisher, *J. Phys. Chem. B* **105**, 11785 (2001).